Light and Lighting

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Object and Background

OBJECT and background—these two words dominate illuminating engineering.

Our aim in all lighting problems is to make certain things clearly defined and easy to look at. Certainly the first thing is to ensure that the objects receive *sufficient light* to reveal them fully. But the appearance of objects thus illuminated depends very greatly on what is behind them.

Obviously *the background must not be too bright*. If there is glare this distresses the eye, but even a moderate excess of brightness will impair its powers of perception. Yet the background must not be too dark, otherwise the excessive contrast fatigues the eye.

We must, however, always remember what we are asking the eye to do. Is it required only to recognise *outlines*; or also to appreciate small changes in light and shade on which the recognition of *form* depends? Is the eye to make a sustained effort to detect small differences during long periods of time? Or only to recognise by a casual glance? Is our intention merely to attract notice, in which case it is *emphasis* rather than the revealing of detail that we desire.

On such questions the desirable contrast between object and background necessarily depends.

Illuminating Engineering in Australia

From a recent issue of the *I.E.S. Lighting Review* it is evident that the Illuminating Engineering Society of Australia is very actively at work. There are now three individual bodies federated under the above title with headquarters in Victoria, New South Wales, and South Australia, all of which hold meetings at regular intervals.

The Victorian Society has now a series of committees, dealing not only with administrative matters (membership, papers, and finance, etc.), but also with special topics such as Wartime Lighting, Education, and Lighting Standards. Dr. P. H. Cooke, Psychologist of the Department of Labour and National Service, recently addressed the Society in Victoria on the subject of "Reaction to Surroundings," and in particular the psychological reaction to good lighting in industry. Lecture demonstrations are being arranged by the Industrial Lighting Committee. Similar steps with regard to demonstrations are being taken by the Society in New South Wales, which is also making special investigation into the Lighting of Technical Colleges throughout the State (a course in illumination is already sponsored at the Sydney Technical College).

The Society in South Australia has prepared an excellent programme for 1943 in which the properties of Fluorescent Lamps and the study of Optics and Vision all play a part. Amongst papers on more specialised aspects of illuminating engineering we note those on Artificial Illumination in connection with Photography and Illumination for Block making.

All the three Societies are actively interested in arrangements for Wartime Industrial Lighting, in which joint action is being taken.

Centres and Groups

The network of I.E.S. Centres and Groups is continually expanding. We understand that consent has been given to the coalition of the Groups in Bath and Bristol to form a new Centre, to be known as "The Bath and Bristol Centre (Western Area)." This change will take effect with the opening of the new session, activities being divided between the two cities named —though there may well be meetings in others.

Another addition to the list of Groups is Derby, recently visited by the President, where Mr. C. S. Wheeler (Grove Mansions, 91, Burton-road, Derby) is acting as honorary local secretary. All those in the vicinity interested in this new Group are advised to get in touch with him.

Both in the Midland and North Midland Areas there are now two Centres in operation, and there may well be more in the future. The time is therefore ripe for the conception of "Areas," within which quite a number of Centres may exist simultaneously. Plans for this wider scheme of operations have already been made. For some little time the division of Great Britain into eight distinct areas has been visualised. Of these there is only one, the South Eastern Area, in which there are as yet no Centres or Groups in existance, but this is understandable in present circumstances.

Lighting Reconstruction

Two years have passed since Mr. R. O. Ackerley gave his address to the I.E.S. on Lighting Reconstruction. Much has doubtless been done since then. Committees have been set up, educational pamphlets have been prepared, the position in regard to legislation on lighting has been explored, and contacts with Government Departments and other authorities have been made. In addition, there is, as I.E.S. members are aware, a Committee sitting under the aegis of the Department of Scientific and Industrial Research, which is reviewing the post-war lighting of certain buildings (dwellings, schools, and offices), and before which the Society has several times presented evidence. No doubt this is all to the good. One must, of course, realise the position likely to arise after the termination of hostilities, when there will be an enormous amount of urgent rebuilding to be done, when there may be little money to spare, and when materials will almost certainly have to be severely rationed. [Some authorities, one is told, have already prepared rebuilding schemes far in advance of possible allocations.] It is natural and proper, therefore, that the authorities should be preoccupied mainly with vital and urgent tasks, and that their conceptions of building and of the accompanying lighting facilities should be governed by urgent needs and speedy production. At the same time, one cannot but feel sympathy with the view expressed in the address delivered to the I.E.S. by Mr. Howard Robertson last year, that standardisation may go so far that we may have to say "good-bye to the finer conception of planning and building." It should be remembered that "man does not live by bread alone." One may well hope that some consideration will be paid to creative work such as will be an inspiration for the future as well as satisfying material needs. Let some attention be given to individual rebuilding schemes with a lofty conception behind them, and appropriate lighting as an integral part of the design.

The Education and Training of Physicists

A report on this subject, issued by the Board of the Institute of Physics, contains a strong plea for a broad education for the physicist so that he may be fitted both for co-operation in a team and for leadership in posts of high responsibility. The present scholarship system is criticised. The spending of all three years of undergraduate study in an Honours School of Physics, to the virtual exclusion of other sciences, is considered undesirable specialisation. A general course in science is preferred, and an increased study of English language and literature, in order that physicists may be able "to express themselves in clear, precise, and attractive English," is strongly advocated. Students of physics would also benefit from some direct contact with industry as part of their training. These remarks have a general application to scientific workers and technical experts (including illuminating engineers), who are prone to become unduly specialised, and to lose that broad and sagacious outlook on human affairs which is essential to full co-operation with the community. Ability to express views clearly and attractively, both in speech and in writing, is a gift too little cultivated by the expert. The report also looks forward to the adoption of a State Bursary Scheme, by which all those with sufficient ability will be free to profit. Here, too, is something that should not be overlooked by young illuminating engineers, anxious to fit themselves for their vocation.

The Lovibond Tintometer

Proceedings at a Meeting of the Colour Group on May 12th, 1943

On May 12 the members of the Colour Group, under the chairmanship of Mr. J. Guild, met at the E.L.M.A. Lighting Service Bureau to listen to a lecture by Mr. G. S. Fawcett, of Tintometer, Ltd., who took as his subject "Sixty Years of Colorimetry." The first part of the lecture was a sketch of the quite adventurous career of Joseph Williams Lovibond before he settled down in Salisbury to devote himself to business, including brewing. It was Lovibond's realisation of the connection between the colour of beer and its palatability that made him seek for a means to standardise and measure in some way the tint of any sample as it came from the brew-house. His early scale, which consisted of fifty-two coloured glasses, is still in use and specimens of some of the original glasses were shown at the conclusion of the meeting. Other manufacturers soon took up the subject, and it was not long before it began to be applied in the sugar, oil, and tanning industries, as well as in brewing. After his retirement and until his death in 1917, Lovibond took a great interest in camouflage problems, in connection with which he constructed a gigantic colour top.

The lecturer then went on to describe various forms of tintometer which had been developed, particularly one used for the determination of vitamin A by means of a very fugitive colour change in a solution. He mentioned the extensive study of the filters carried on in 1927 by the Bureau of Standards and showed the spectrophotometric curves for the red, yellow, and blue glasses. He expressed the opinion that the C.I.E. system of colour specification was not as well known as it should be, owing to the lack of popular description of it and of the method of applying it. He then showed the ingenious charts, devised by Dr. Schofield, of Rothamstead, by means of which it was a very quick and easy matter to convert colours expressed on the Lovibond scale to C.I.E. values and vice versa. An interesting comparison between the tintometer and a trichromatic colorimeter had been made, using the B.S.I. book of colour samples. These had been measured on both instruments, and the results, expressed on the C.I.E. system, had been compared and had shown, in general, quite good agreement.

Mr. Fawcett then mentioned some of the war-time applications of the tintometer, such as control of the chlorination of water, the detection of noxious gases in industry, various clinical determinations, including sulphanilamide, etc. He said that colorimetry had now established itself permanently in the chemical laboratory and the chemist was making more and more use of it in his routine tests.

The lecture was followed by an interesting discussion, in the course of which Dr. Schofield referred to the permanence of the coloured glasses used in the instrument. Mr. T. Smith recalled a visit which Lovibond had paid to the National Physical Laboratory and the discussions on systems of colour measurement which had taken place.

Street Accidents and the Black-out

It is stated that night traffic accidents in Bridgeport and New Haven (Connecticut, U.S.A.) have risen 21 per cent. since the dim-out has been in effect, although day-time accidents have diminished almost as much, owing to lighter traffic and lower speeds.

Fluorescent Lighting for Aircraft Construction

An account recently appeared in the *Magazine of Light* (U.S.A.) of the lighting, with fluorescent lamps, of a very large aircraft assembly plant. All the lamps were mounted at roof level, so that a species of skylight effect was produced, with a clear view right down the length of the large interior. An allowance of approximately 125 sq. ft. per outlet was made.

The fluorescent lamps appear to have special advantages for the illumination of aircraft assembly processes. In particular the low brightness of these sources and the highly diffused nature of the light have merits.

Most aeroplanes exhibit considerable areas of specular surface before they are painted, and the use of low brightness sources helps to minimise reflected glare. It is also found that in certain operations—treating the undersides of wings, for example—workers cannot avoid looking upwards into the sources of light. It is an advantage, therefore, when these are of low brightness and at a considerable distance. Soft shadows are produced and the light penetrates well into crannies. The undersides of wings, for instance, are relatively well illuminated and even the detail in the landing-wheel inset can be clearly seen. Supplementary lighting (from 20-watt fluorescent lamps in porcelain reflectors) was only needed in one situation, namely, in the interiors of aeroplane cabins.

Reported values of horizontal illumination appear to range from about 14 to nearly 30 ft.c. Vertical illumination, specially important in this field of work, is somewhat lower, but usually of the order of 10 ft.c.

It is remarked that the number of "outages" observed in this large installation was about 3 per cent., which is considered a low figure.

New G.E.C. Directors

Three new directors of the General Electric Company, Ltd., Mr. P. Ashley Cooper, Dr. C. C. Garrard, and Mr. G. Chelioti, have been appointed. Mr. Ashley Cooper is a director of the Bank of England and many other important undertakings. Dr. Garrard is an authority on switch and control gear. Mr. Chelioti has been prominently associated with the manufacture of lamps and valves.

Fifty Foot-Candles on the Working Plane

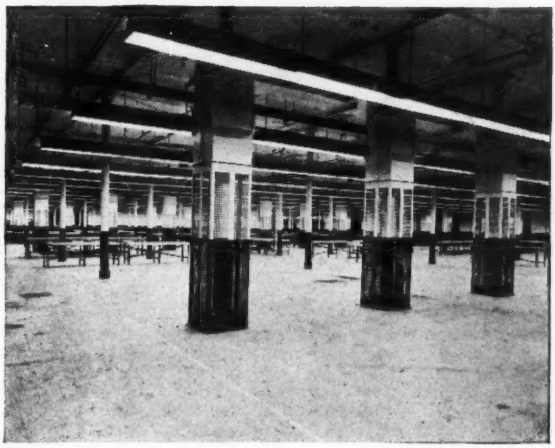
Although in the United States installations affording a general illumination of 100 or even 150 foot-candles are said to be found in some of the defence factories, in this country a factory provided with even 50 foot-candles is something of a rarity.

Much interest, therefore, attaches to a new factory, 35,000 sq. ft. in area, which is to be devoted to the manufacture of small and very intricate mechanisms for the armed forces. For this special work a very high value of illumination is essential, but it is also necessary to avoid the drawbacks liable to be met with such exceptionally high values—e.g., glare, very deep shadows and excessive heat.

Fluorescent tubes suggest themselves as the best means of solving the problem owing to the low brightness and cool nature of the source. It was eventually agreed in this case to adopt the Osram T.T. (twin tube) circuit with pairs of tubes in continuous troughing and mounted 10 ft. above the floor, the maximum height available. The twin tube circuit has several definite advantages. Whilst the wiring is not more complicated than in the case of ordinary methods and the cost is not increased, unity power factor is obtained and stroboscopic effects are almost eliminated without having recourse to multiphase supplies.

In all the scheme embodies twenty continuous rows of twenty-two units, each of which employs two 80-watt tubes. The spacing between rows is 11 ft. and an overall length of tubes of about 2,400 ft. is used.

Subsequent tests of the completed installation have confirmed initial expectations. In spite of the high illumination there is no appreciable glare. A very high order of uniformity of illumination is attained and, as the picture suggests, there is an apparent complete absence of shadow.



A view of the installation described above, which provides a general illumination of 50 foot-candles over an area of 35,000 square feet. The Osram T.T. (twin tube) fluorescent lighting is adopted. Attention is drawn to the apparent absence of shadows and high degree of diffusion of light.

Problems in Visual Psychology

Professor Bartlett gives the Thomas Young Oration to the Physical Society

The thirteenth Thomas Young Oration of the Physical Society was delivered on June 4 by Professor F. C. Bartlett, F.R.S., who took as his subject, "Some Current Problems in Visual Functions and Visual Perception."

In a witty preamble Professor Bartlett speculated how Thomas Young, as we knew him from his writings and his biographers, would have reacted to modern trends in psychology. Young seemed to have had a highly objective, not to say humourless, approach to life, and there was little evidence that he interested himself in human behaviour. However his recorded reluctance to leave the beauties of Inverary (female ones) and a few other indications allowed us to believe that he was not completely indifferent to social influences.

Professor Bartlett took Young's discovery of the accommodative mechanism of the eye as a starting point for his main theme. Recently, the time required for the delicate musculature of the eye to take up a new adjustment had proved a valuable indicator of general fatigue. For example, after violent exercise the accommodation time was increased for about half an hour. However, after several cycles of exercise and recovery, the increase in accommodation time was found for some subjects to have diminished as though some kind of adaptation to the situation had set in. There was a wide field here for the study of general behaviour by using the responses of a single sense as an indicator.

Another group of psychological questions concerned cases in which the visual sense and some other sense, e.g., kinæsthetic or postural, presented conflicting cues to the mind. Which would the mind accept or would some compromise be made? How would the response vary for different observers? The answers to such questions had an important bearing on many practical problems in this age of speed and machines. In Professor Bartlett's opinion, the next big advance in psychology would be made in this field.

A third type of psychological problem was illustrated by recent work on the recognition of patterns in low illuminations by the dark-adapted eye. The best observers, it had been found, were not necessarily those with the most sensitive night vision as judged by a simple threshold test. This suggested that "intelligence" was a factor in the experiment. However, it was also established that the best observers were not necessarily those giving the highest scores on the recognised intelligence tests. Professor Bartlett thought that this showed there was another kind of intelligence, the intelligence of the artist and the craftsman perhaps, which was not revealed in the handling of systems of symbols, such as words or numbers, and which would therefore elude the existing intelligence tests. The implications of this interesting speculation in the field of education were briefly touched on.

Reverting, finally, to Thomas Young, Professor Bartlett judged that however strange the psychological developments he had described might appear to him, Young would certainly approve the present-day emphasis on the experimental approach.

Group Replacement of Fluorescent Lamps

In pre-war days the adoption of group replacement in connection with installations of incandescent electric lamps had become quite general. In large installations there is good evidence for the belief that it may be more economical to replace all lamps at agreed regular intervals than to replace each individual lamp when it gives way.

It is, perhaps, too early as yet to come to similar conclusions in regard to the group replacement of fluorescent lamps, but the very large installations of such lamps coming into use in the United States has enabled useful data to be collected. Some of these data formed the subject of a paper by Mr. Harris Reinhardt in *Illuminating Engineering* (U.S.A., April, 1943).

Tabular data presented in this paper indicate that when 10 per cent. of the lamps have failed they will have burned 65 per cent. of their average life, whilst when 20 per cent. have failed they will have burned 80 per cent. of their average life.

Two alternative methods of group replacement are available, namely, (1) to allow the lamp which burns out to remain in the fixtures until the group replacement is made; or (2) to replace the lamps immediately they have burned out so as to keep them burning in all the sockets until the group replacement time has arrived.

The first method is only practicable in cases where the loss of life from the burned-out lamps would not be serious. In any case a cut-out starter would have to be used to obviate the troublesome flashing of lamps that have failed. If the second method is adopted the new lamps may be marked when they are installed so that they can be recognised and used again when the group replacement is made.

In planning a schedule a record of the percentage of burn-outs should prove a more accurate guide than a record of the number of burning hours, partly because records can be more easily maintained, and partly because the actual average life of present-day lamps may be considerably better than the rated average life.

The author works out formulae enabling specific cases to be dealt with and presents a tabular comparison between the comparative cost of individual and group replacement on an installation of one thousand 40-watt lamps. It would appear that in this case the group replacement system shows the greatest economy, namely, $365 if method No. 1 is adopted (i.e., burned-out lamps are allowed to remain in outlets until group replacement is made). If, however, method No. 2 is adopted there is still an appreciable saving ($83), though not so great as in the first.

It is, of course, evident that in any large installation there will be special factors which affect the problem, such as the case with which lamps can be reached for replacement. It is possible to simplify the process by treating the installation in sections and adopting a group replacement system which enables certain series of lamps to be dealt with in rotation.

Magnifying Device Aids Production

In *Illuminating Engineering* (U.S.A.) reference is made to an inspection device, containing a light bulb, two mirrors, and four magnifying lenses, which has greatly aided the inspection of acorn-sized commutators for dynamotors supplying electric power to aircraft radio equipment. An image of the surface magnified twenty-two times normal size is presented to the eyes of girl workers, who are now much better able to examine the minute copper and mica strips, ranging in thickness from 18 to 50 thousandths of an inch. As a result, production has advanced 20 per cent. and the cost has been diminished by 10 per cent.

The experience confirms that of Mr. H. C. Weston, who found that magnifying glasses were of great value for close work in the hosiery "linking up" process. In this case, however, magnifying glasses alone, whilst giving some relief, were not so satisfactory as the device mentioned above, which, in effect, combines magnification with strong local lighting.

In Lighter Vein

An account of the I.E.S. Informal Social Evening, held, by invitation of the General Electric Company, Ltd., at Magnet House, Kingsway, London, on May 11th, 1943.

It was a happy thought which prompted the idea of an informal social evening, held on the evening of May 11, after the more serious business of the I.E.S. annual general meeting and sessional evening during the afternoon. Such events are naturally only arranged with great difficulty in present circumstances, and this—the first of its kind since the outbreak of war—was rendered possible mainly by the hospitality of the General Electric Company, Ltd., who entertained upwards of 250 members and friends at Magnet House.

The party was introduced by Mr. R. O. Ackerley, president of the I.E.S., and was welcomed by Dr. A. H. Railing, chairman and joint managing director of the G.E.C., who referred in very kind terms to the Society and to the good work which it had done and is still doing.

The show which followed may well be introduced by quoting from the opening page of the programme—an ingenious document furnished with many quips and cranks, from the sale of which the Red Cross benefited to the extent of £10.

Fig. 1. A view of the audience. In the foreground may be seen, reading from the left, Mr. J. Y. Fletcher, Dr. C. C. Paterson, Sir John Parsons, Mrs. H. C. Weston, and Sir Duncan Wilson. Amongst others less clearly visible on the right are the President (Mr. R. O. Ackerley) and Mrs. Ackerley, Mrs. Paterson, and Mr. and Mrs. Rawlings.

> "At six thirty of the clock on the evening of the eleventh day of May in the nineteen hundred and forty-third year of our Lord, certain indiscreet and light-minded members of that ancient aggregation of artificers of light, or foot-candle fakers, commonly known as The Illuminating Engineering Society, will, for the amusement and enlightenment of their fellows and of such of their friends as may be persuaded to attend, present with song, dance and declamation the divertissement herein described and itemised."

The nature of the show may be gathered in some measure from the accompanying illustrations. It included four items:

(1) A humorous event entitled "Initiation Ceremony into the Ancient Order of Lu Men"; (2) a well-written parody, "Brains Trussed," which included "Dr. Luminous Fluxley," "Professor Lighting Load," "Commander F. T. Candle," "Miss Milli Lambert," and "Mr. Lightup Holmes"; (3) a musical potpourri of songs old and new,

Fig. 2. Initiation Ceremony into the Ancient Order of Lu Men.

Fig. 3. First Session of "Brains Trussed."

Fig. 4. The Musical Committee in full song.

cleverly and wittily parodied to describe how *not* to design a domestic lighting scheme and entitled "Musical Committee Meeting"; (4) "Red Sales in the Sunset," this being an episode in the life of a "high power" salesman (power factor, nil), Slaphappy Steve by name, who endeavoured, by brute force and not much cajolery, to sell light to a quite unenlightened customer.

The programme as a whole enlisted the effort of quite a considerable number of I.E.S. members and friends. The standard attained was remarkable when one considers the short time available in which to unearth and assemble talent, and the very limited opportunities for preparation and rehearsal in these busy times. Each event will doubtless have its supporters. The first item offered the greatest opportunity for spectacular lighting and fluorescent effects, the "Brains Trussed" was ingenious and amusing, and the final event remarkable for breathless speed and incident—but for sustained interest the writer would be inclined to award the palm to the musical committee, who showed great skill in sustaining their melodious programme through its various stages without a hitch.

The performers all acquitted themselves with credit, and their efforts were warmly applauded by the audience. The services of those who shared in the preparation of the script and the organisation of events also deserve recognition In this connection one might name Mr. C. W. M. Phillips, Mr. E. B. Sawyer, Mr. W. R. Stevens, and Mr. H. C. Weston, and, of course, the president himself, to whose happy inspiration the evening's entertainment was mainly due.

It was very pleasant to observe in the audience so many I.E.S. members whose memories go back to the beginnings of the Society. This was remarked upon by Mr. F. C. Smith who at the close of the evening, moved a vote of thanks to the performers and to the General Electric Company for their hospitality. In thanking Dr. Railing for his cordial reception and kind references to the Society, he alluded to the presence of other directors of the G.E.C. who had also been associated with the I.E.S. as members for many years, two of whom, Dr. C. C. Paterson and Mr. J. Y. Fletcher, are visible in the front row of the audience in Fig. 1.

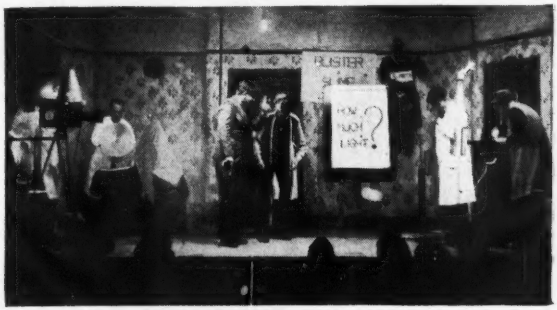


Fig. 5. "Red Sales in the Sunset." Slaphappy Steve supported by assistants and a battery of weird light measuring instruments. On the right is an easel on which stimulating messages appeared at rapid intervals.

Contrast and Background

(*Communicated*)

The selection of the background—on which so much stress is now placed in connection with lighting installations—is not merely a psychological matter as is sometimes assumed, but also influences perception. People in general prefer bright rather than sombre surroundings and it is a fact that the eye is conscious of discomfort when the ratio of the brightness of objects examined and the surroundings is too great, e.g. if it exceeds about 100 to 1.

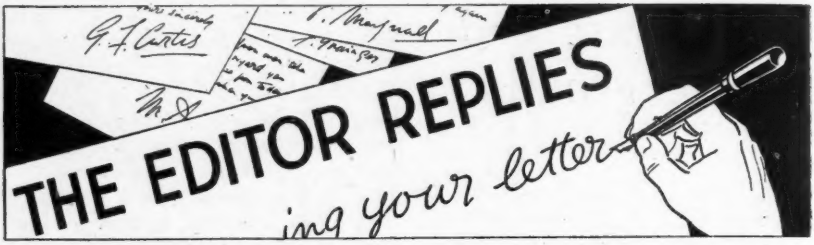
But the perception of the eye—so far as the recognition of delicate shades is concerned—is adversely affected with contrasts very much less violent than this. The familiar diagram given in Dr. Lythgoe's paper* is often quoted in this connection but few people realise all its implications. The diagram, it may be recalled, related to a test object receiving an illumination of 13 ft.c. Visual acuity was a maximum, apparently, with an illumination of surroundings of near 4 ft.c. For illuminations of the surround between 1 and 10 ft.c. there was, however, not very much difference in visual acuity. It was only when the brightness of the surround in equivalent foot-candles fell below 1 or increased above 10 that a substantial reduction occurred. In particular the fall was very rapid once 10 ft.c. was exceeded—it may be accepted, in fact, that the brightness of the surround ought never to be greater than the brightness of the material or object which is the subject of study (except in the case of "silhouette vision").

If one considers an ordinary office or schoolroom one sees at once that the suggestion that walls should be finished in matt buff, or other light colour (not white) is justified by the above conclusion. For if one is examining white paper (ref. factor say 75 per cent.) by an illumination of say 12 ft.c. resulting in a brightness of 9 e.f.c., one ought, for maximum acuity, to have a background of about 3 e.f.c.—and a brightness of this order might quite well be attained with a wall finish having a reflection factor of the order of 40 to 50 per cent.

If, on the other hand, one is working with very dark material, or examining some very dark-coloured object and still wishes to have a surround of fair brightness and cheerful aspect, the only solution would seem to be to balance the low reflecting power of this material by the aid of some form of local lighting.

It should, of course, be realised that consideration of psychological effect ("cheerfulness") and visual acuity by no means exhaust the problem. Maximum visual acuity is not always necessary or even desirable, especially when aesthetic factors arise. It has been suggested to the writer, for example, that dark oak furniture "looks best" against a light buff background, though the ratio in brightness may be far greater than that suggested above. What is needed here is *emphasis*—the eye should be attracted to the dark furniture which "stands out," but it is not at all necessary that all the details (including possible chips and blemishes) should be visible. Somewhat different considerations arise if one takes the case of a room used for a lecture theatre or social gathering. Here both emphasis and perception come in. It should be easy to recognise the faces of people at some little distance—but experience shows that it is not always easy to do so in a large room when the walls have the same order of brightness as the faces and possibly also bear a general resemblance to them in regard to colour.

*"Visual Perceptions under Modern Conditions." Trans. Illum. Eng. Soc. (London). Vol. I, Jan., 1936, p. 5.



My attention has been drawn to several comments in the daily Press on the subject of **Street Lighting,** e.g., the statement attributed to an official connected with a local authority in the vicinity of London who is in favour of **scrapping lamp posts**—on the ground that **searchlights** would furnish a more useful and economical form of illumination.

I do not think that public lighting engineers are likely to be impressed by this suggestion. They will doubtless continue to adhere to their belief that lamp posts will be urgently needed when the lights go up once more. At the same time one should not dismiss as entirely visionary the suggestion that **searchlights,** or some equivalent, might be used on occasion to **supplement ordinary street lighting.** The quality of light obtained by reflection from the clouds has undoubted advantages. Moreover, the evident drawback that such a method depends greatly on **climatic conditions** and would presumably be difficult to apply on clear nights, hardly seems to justify completely dismissing the idea—for in this country **clear nights are the exception.**

It has also been reported that a conference of representatives of the boroughs is considering the **post-war lighting of London.** I am afraid that I know nothing of their deliberations. I have also been asked whether the Ministry of Transport is likely to make recommendations developing from the proposals in their report issued shortly before the war, and, in particular, whether some form of **Central Control of Public Lighting** is likely to be established by them. I really cannot say.

I have had some queries put to me in regard to the **application of Fluorescent Lamps** after the war. These will doubtless be very extensive. It must always be remembered that the present 4-ft. 80-watt tube is being developed merely as the most convenient for industrial use. After the war there will doubtless be many different sizes of lamps, adapted to widely different purposes, as has already happened in the United States.

There is, however, one circumstance that may hinder their development, namely, the extraordinary system of **variation in electrical supply** throughout this country. The writer has the misfortune to live in a district with a supply of 240 volts D.C., which has manifest drawbacks. We have often been assured that in the future standardisation at, say, 120 volts A.C. will be attained, but in the meantime the variation still persists. In the words of the American poet, "It *is*—though it hadn't oughter be."

One manifest advantage of fluorescent lamps is that **their light mingles so well with daylight** and can therefore be used to supplement natural lighting without the eye being conscious of anything abnormal. There is no objection, therefore, to using this form of lighting to strengthen the illumination in parts of the room most remote from windows. I am not quite sure, however, whether this practice is equally desirable when ordinary artificial lighting, obviously different in colour from natural lighting,

is in use. It has been argued that when daylight is definitely fading it is better policy to pull down the blinds and **go over completely to artificial lighting,** especially in view of the fact that the brightness of windows so often tends to depress the illumination in some parts of the room, causing it to appear worse lighted than it really is.

I have been asked for some **ready rule for determining the illumination** available in an interior when the consumption in watts per sq. ft. is given. I cannot do better than refer those interested to the simple and ingenious diagrams prepared by Mr. Weston, which appeared in LIGHT AND LIGHTING a few months back.* These are quite helpful in simple cases. In the case of more intricate problems there is no royal road to results. One must take account of the various factors, as can be done by means of the tabular data to be found in the E.L.M.A. handbook. Experience has shown that this process gives surprisingly accurate results, even in cases where unusual decorative fittings are adopted and rather complex methods of utilising reflection from walls and ceilings, recessed domes, and other surfaces are used—provided the characteristics of the lighting unit and the reflecting surfaces are fully known.

In applying all rules, presupposing fairly uniform illumination over a given area, there is one circumstance to be borne in mind—namely, that it is **rarely necessary** in practice **to illuminate the peripheral regions of the room** as strongly as the centre. In the case of a very large interior it makes little difference whether or no one takes account of, say, a two-foot border round the perimeter. But in the case of a small room the difference is surprising. Thus, if one applies this to a room 14 ft. sq. (area 196 sq. ft.), one finds that cutting off 2 ft. all round reduces the area to be treated (10 ft. sq., or 100 sq. ft.) to nearly half! In small rooms, therefore, one may well aim chiefly at lighting the central area, where the table is situated, and achieve some economy in the calculated wattage based on conventional rules.

* Light and Lighting, Oct., 1942, p. 133; Nov., 1942, p. 138.

In the Honours List

MR. H. LINGARD, M.B.E.

Our attention has been drawn to the award, in the Birthday Honours List, of the M.B.E. to two I.E.S. members, Mr. H. Lingard and Mr. J. C. Sloan.

Mr. H. Lingard, whose portrait appears below, is a Fellow of the Illuminating Engineering Society and a Past Member of Council. At the outbreak of war he was acting as manager of the E.L.M.A. Lighting Service Bureau, but has since

Mr. H. Lingard.

been serving as the principal lighting and power officer at the Ministry of Supply.

MR. J. C. SLOAN, M.B.E.

Mr. J. C. Sloan, who is a leading member of the I.E.S. Glasgow Centre (Scottish Area), is electrical engineer to Messrs, Barclay, Curle, and Co., Ltd., shipbuilders, in that city.

Fluorescent Lighting in a Radio Valve Works

Fig. 1. A sectional view of the grid shop, where an illumination of 25 foot-candles is provided on the working plane. The absence of glare and hard shadows is noticeable.

The manufacture of radio valves plays an important part in the country's war effort. The intricate make-up of a modern valve involves very accurate workmanship and, generally speaking, operations carried out in such a factory as this may be described as "fine." Lighting of the finest quality is therefore desirable. The accompanying photographs show the appearance of a radio valve factory lighted with 80-watt Sieray fluorescent lamps. The illumination is well fitted to the task and the shops present a cheerful appearance. The installation was designed by the illuminating engineering department of Messrs. Siemens Electric Lamps and Supplies, Ltd., and the installation was carried out by the Northmet Power Company, Ltd., using Siemens lamps, fittings, and equipment.

Fig. 2. A section of the main assembly benches, where 25 foot-candles and conditions of lighting similar to those shown above are again provided.